
NT8D15 E & M Trunk Card

Introduction

The NT8D15 E&M Trunk Card is an intelligent peripheral equipment (IPE) device that can be installed in either the NT8D37 IPE Module or the NT8D11 CE/PE Module. The E&M trunk card interfaces four analog telephone trunks to the Meridian 1 switch. Each trunk interface connects to a trunk facility using tip and ring leads that carry voice, ringing, and tone signaling, and to signaling interfaces by E&M leads. Each unit can be configured independently by software control in the Trunk Administration program (LD 14).

The E&M trunk card supports the following types of trunks:

- 2-wire E&M Type I signaling trunks
- 4-wire E&M trunks:
 - Type I or Type II signaling
 - duplex (DX) signaling
- paging (PAG) trunks

Type I signaling utilizes two signaling wires plus ground. Type II and DX signaling utilizes two pairs of signaling wires. Most electronic switching systems use Type II signaling.

[Table 13](#) is a matrix of the signaling and trunk types supported by the E&M trunk card.

Table 13
Trunk and signaling matrix

Signaling	Trunk types			
	RLM/RLR	Tie	PAG	CSA/CAA/CAM
2-wire E&M	Yes	Yes	Yes	Yes
4-wire E&M	Yes	Yes	No	Yes
Legend: RLM Release Link Main RLR Release Link Remote CSA Common Control Switching Arrangement CAA Common Control Switching Arrangement with Automatic Number Identification (ANI) CAM Centralized Automatic Message Accounting (CAMA) trunk				

Physical description

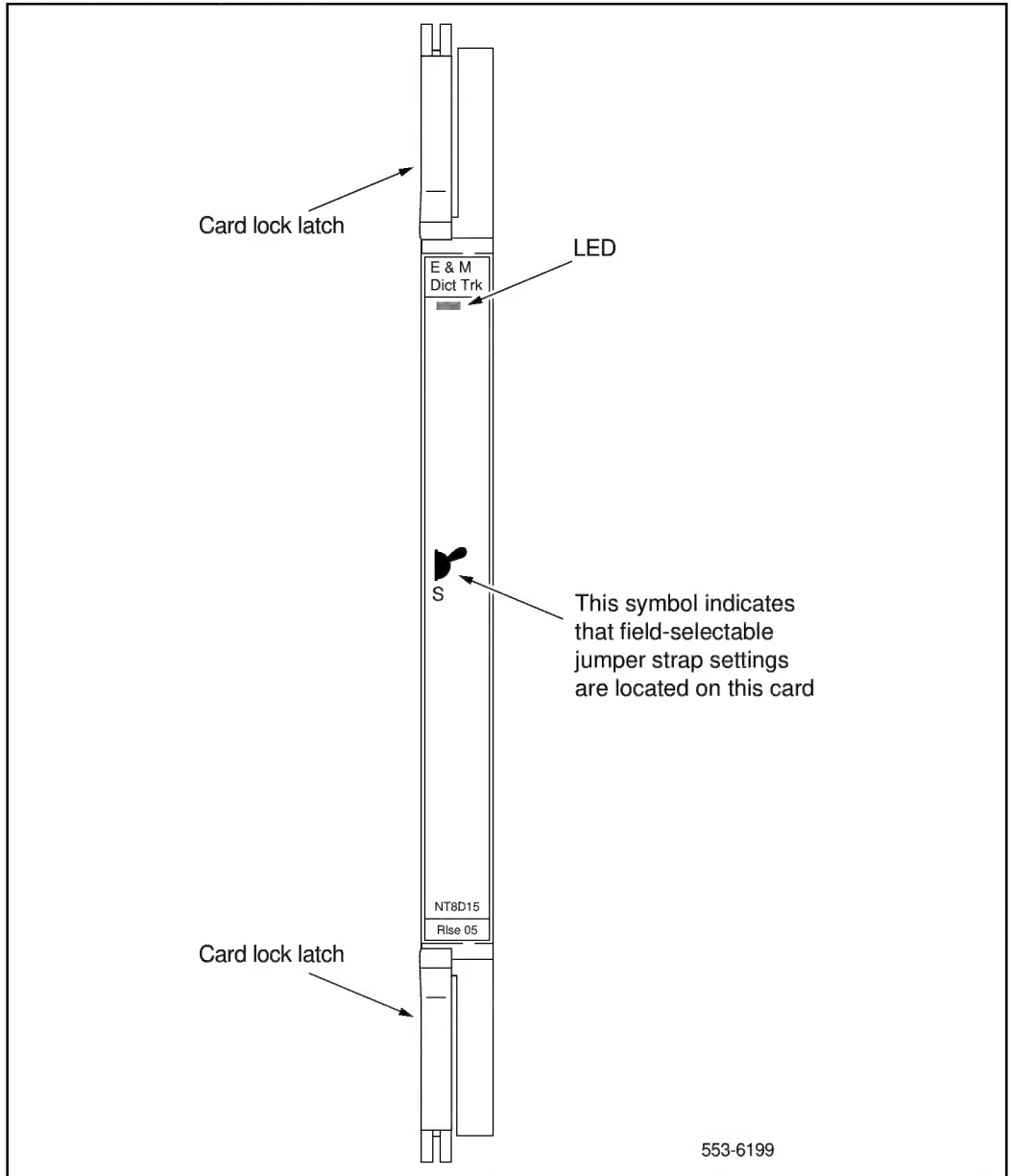
The E&M trunk card mounts in any IPE slot. The line interface and common multiplexing circuitry is mounted on a 31.75 cm by 25.40 cm (12.5 in. by 10 in.) printed circuit board.

The E&M trunk card connects to the IPE backplane through a 160-pin connector shroud. The backplane is cabled to the input/output (I/O) panel on the rear of the module, which is then connected to the main distribution frame (MDF) by 25-pair cables. Telephone lines from station equipment cross connect to the OPS analog line card at the MDF using a wiring plan similar to that used for line cards. See *Meridian 1 system installation procedures* (553-3001-210) for termination and cross connect information.

Refer to [Figure 39](#) for an illustration of the faceplate on the E&M trunk card. The words “Dict Trk” appear on the faceplate label because earlier versions of this card provided dictation trunk connections for third-party equipment.

The faceplate of the card is equipped with a red light emitting diode (LED). When an E&M trunk card is installed, the LED remains lit for 2 to 5 seconds while the self-test runs. If the self-test completes successfully, the LED flashes (off/on) three times and remains lit until the card is configured and enabled in software, then the LED goes out. If the LED does not follow this pattern or operates in any other manner, such as continually flashing or remaining weakly lit, the card should be replaced.

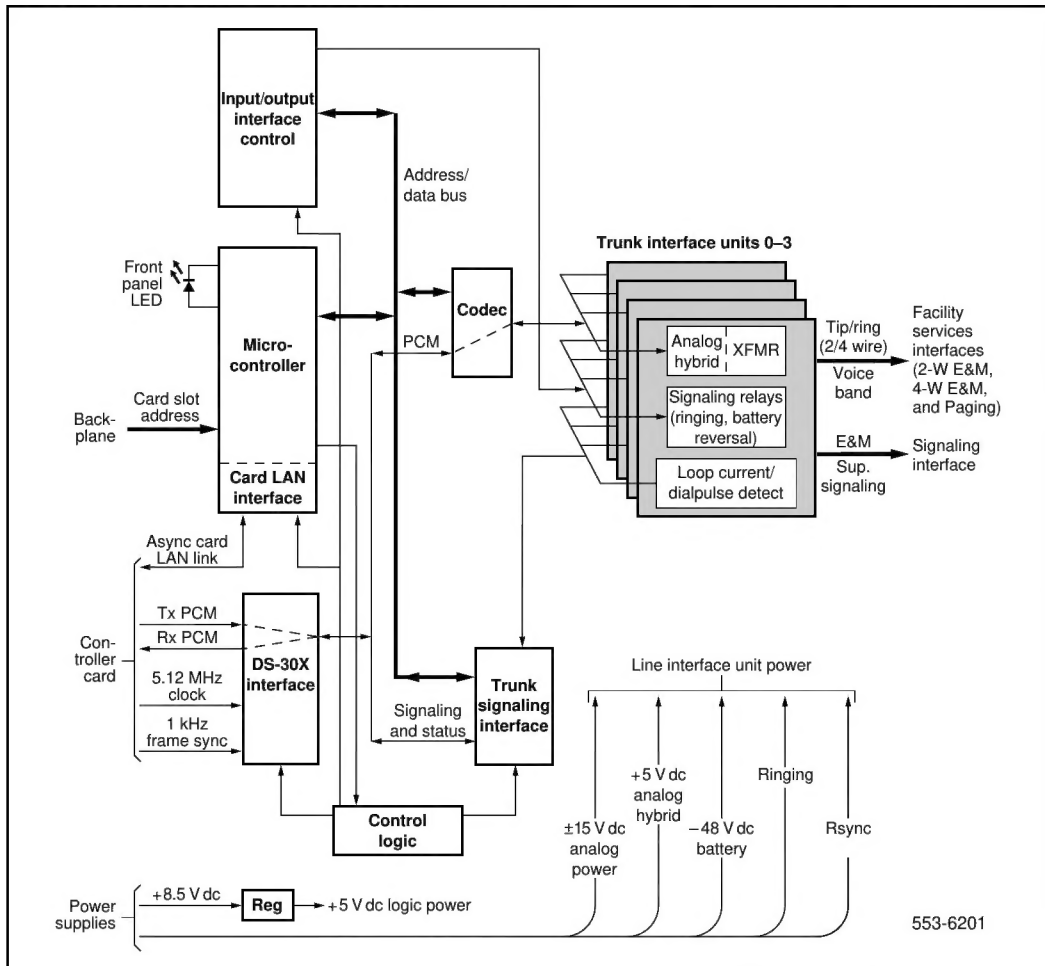
Figure 39
E&M trunk card—faceplate



Functional description

Figure 40 shows a block diagram of the major functions contained on the E&M trunk card. Each of these functions is discussed on the following pages.

Figure 40
E&M trunk card—block diagram



Card interfaces

The E&M trunk card passes voice and signaling data over DS-30X loops, and maintenance data over the card LAN link. These interfaces are discussed in detail in “Intelligent peripheral equipment” on page 15.

Trunk interface units

The E&M trunk card contains four identical and independently configurable trunk interface units (also referred to as circuits). Each unit provides impedance matching and a balance network in a signal transformer/analog hybrid circuit. Also provided are relays for placing outgoing call signaling onto the trunk. Signal detection circuits monitor incoming call signaling. A codec performs A/D and D/A conversion of trunk analog voiceband signals to digital PCM signals.

The four units on the card can operate in the A-Law or the μ -Law companding mode. The mode is selected by making service change entries. Each unit can be independently configured for 2-wire E&M, 4-wire E&M, and paging trunk types. The trunk type is selected by service change entries and jumper strap settings. All units on the card can perform the following features:

- convert transmission signals from analog-to-digital and digital-to-analog
- provide outpulsing on the card: make/break ratios are defined in software and downloaded at power-up and by software command
- provide 600-ohm balance and termination impedance (2-wire configuration)
- provide 600-ohm termination impedance (4-wire configuration)
- provide pad control for 2-wire and 4-wire facility connections
- allow trunk type and function to be configured on a per port basis in software
- provide isolation of foreign potentials from transmission and signaling circuit
- provide software control of A-Law and μ -Law modes
- support loopback of pulse code modulation (PCM) signals to DS-30X for diagnostic purposes

Trunk unit functions

The functions provided by each unit on the E&M trunk card include 2-wire signaling, 4-wire signaling, and paging operation as follows:

- 2-wire, E&M Type I signaling (see [Figure 41](#)) with:
 - near-end seizure and outpulsing with M lead
 - ground detection with E lead
 - voice transmission through tip and ring for transmit and receive
- 4-wire, E&M Type I and II signaling (see [Figure 42](#)), 2-way dial repeating with:
 - echo suppression for Type I signaling
 - switchable 7 dB and 16 dB pads for carrier interface
 - voice transmission and reception through two separate paths
 - Type I signaling through E&M leads
 - Type II signaling with near-end seizure by SB/M leads and far-end detection by E/SG leads
- 4-wire, DX signaling (see [Figure 43](#))
- paging trunk operation (see [Figure 44](#)) with:
 - support access by low-resistance path at the PG/A1 leads
 - paging end-to-end signaling not supported

Figure 41
E&M Type I signaling

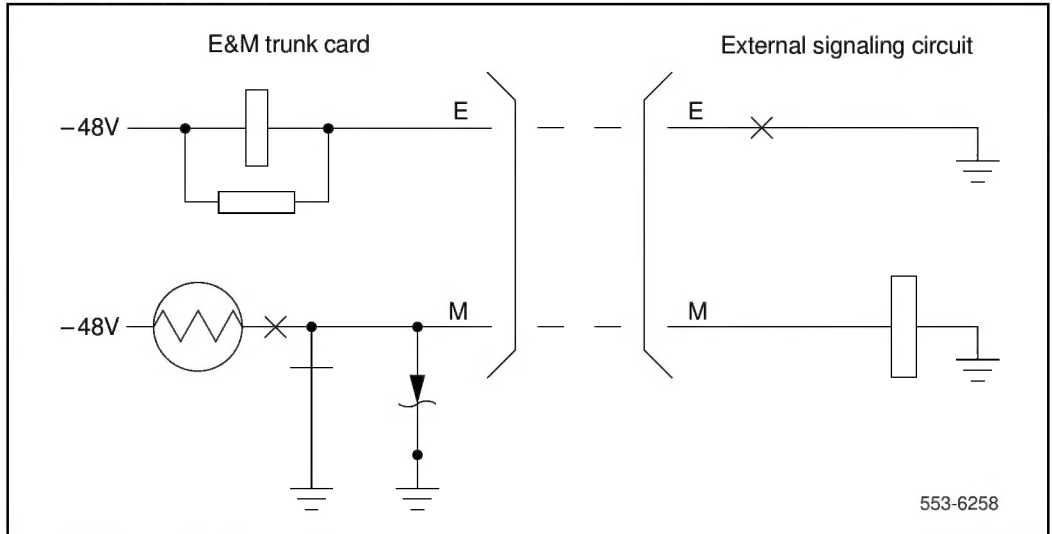


Figure 42
E&M Type II signaling

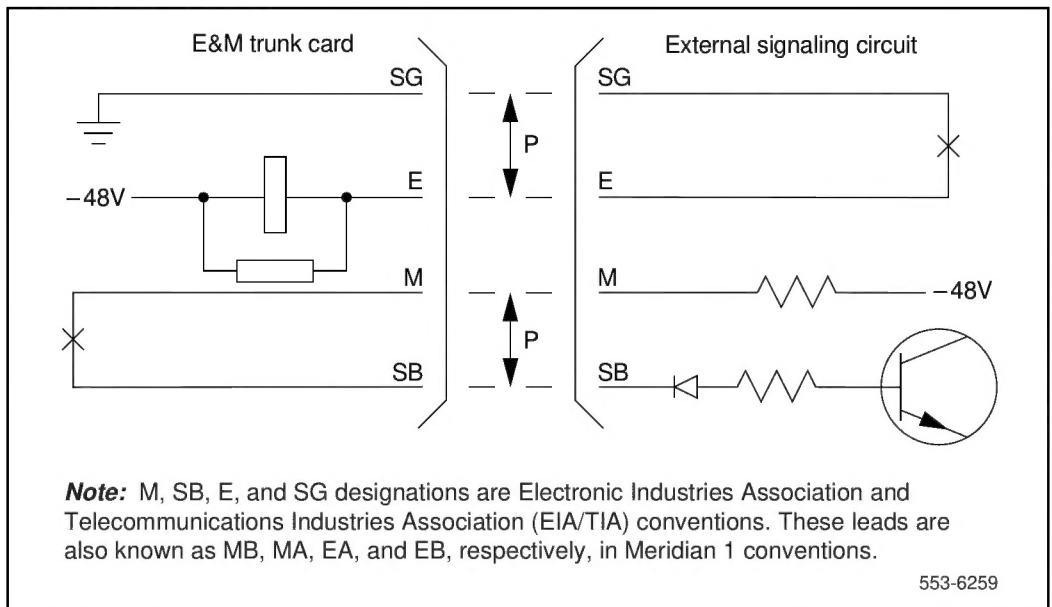
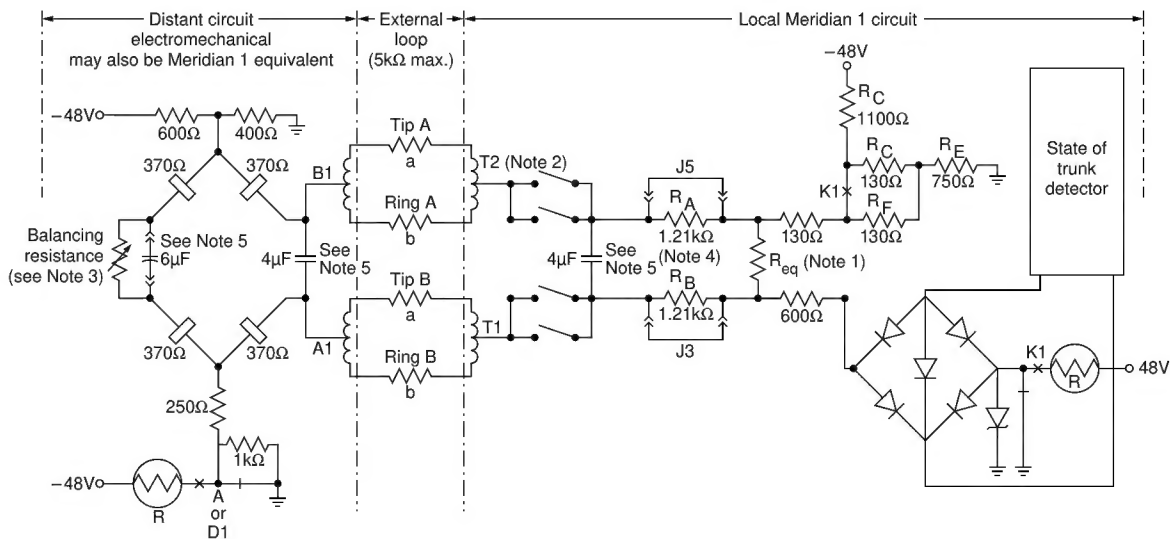


Figure 43
4-wire DX signaling



Note 1: The equivalent bridge circuit resistance as seen from distant trunk during the signaling is 1250 ± 125 Ohms.

Note 2: T1 and T2 resistance is 47 Ohms for 600 Ohm termination option.

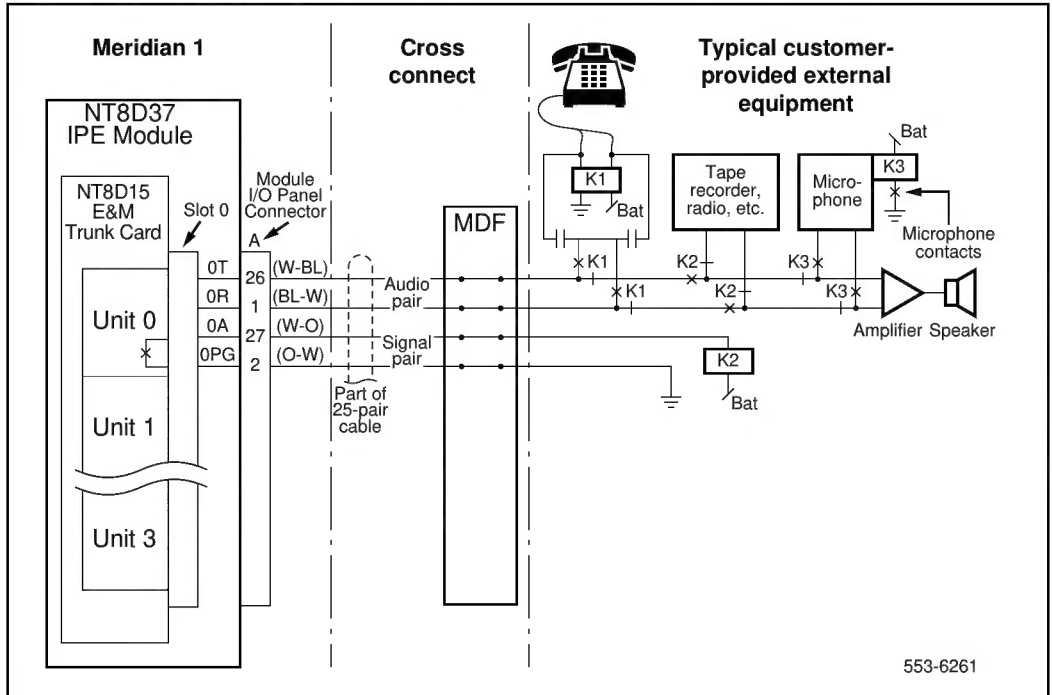
Note 3: Compute total balancing resistance as follows (note that in some new DX circuits, a 1260 Ohm resistor is permanently wired in series with the selectable resistance). Total balancing $R = \text{external loop resistance} + 0.5 \times T1 \text{ resistance} + 0.5 \times T2 \text{ resistance} + [(R_A + R_D) \text{ if not shorted out}] + R_{eq}$. Resistance of transformers at electromechanical end is low and can be ignored. "External loop resistance" is defined as 1/2 the loop resistance of one cable pair.

Note 4: If the external loop is >2500 Ohms, the loop adjustment resistors R_A and R_B are shorted out. If the external loop is <2500 Ohms, R_A and R_B are in the circuit. When the Meridian 1 is connected to another Meridian 1 or pulse and external loop resistance is <2500 Ohms, the loop adjustment resistors must be shorted in one machine. If the external loop is >2500 Ohms, the loop adjustment resistors must be shorted out in both machines.

Note 5: When the Meridian 1 is connected to an electromechanical trunk using 4-wire operation, a 4μF capacitor must be connected from the A1 to B1 lead at each end of the trunk. (These may already be installed.) It is also recommended that a 6μF capacitor be connected in series with the balancing resistance.

553-6260

Figure 44
Paging trunk operation



Card control functions

Control functions are provided by a microcontroller, a card LAN, and signaling and control circuits on the E&M trunk card.

Microcontroller

The E&M trunk card contains a microcontroller that controls the internal operation of the card and the serial communication link to the NT8D01 Controller Card. The microcontroller provides the following functions:

- card-identification
- self-test
- control of card operation
- status report to the controller
- maintenance diagnostics

Card LAN

The card LAN provides a serial communication link for transferring maintenance data and control signals between the trunk card and the NT8D01 Controller Card. The card LAN controls the microcontroller. The following functions are supported:

- providing card ID/RLS
- reporting self-test status
- polling from the controller card
- enabling/disabling of the DS-30X link

Signaling and control

The signaling and control portion of the E&M trunk card works with the system CPU to operate the card hardware. The card receives messages from the CPU over a signaling channel in the DS-30X loop and returns status information to the CPU over the same channel. The signaling and control portion of the card provides analog loop terminations that establish, supervise, and take down call connections.

Configuration information for the E&M trunk card is downloaded from the CPU at power-up and by command from maintenance programs. Seven configuration messages are sent. One message is sent to each of the four units to configure trunk and signaling type. The remaining three messages are sent per card to select the make/break ratio and the A-Law and μ -Law modes.

The signaling and control circuits on the card perform the following functions:

- provide interface between the card and the system CPU
 - transmit PCM signals from each of the four units to one DS-30X timeslot in A10 format (ready to send/clear to send—flow control, handshake format)
 - transmit and receive signaling messages over a DS-30X signaling channel in A10 format
- decode received messages to set configuration and activate/deactivate interface relays for PCM loopback diagnostic purposes
- decode outpulsing messages (one per digit) from the CPU to drive outpulsing relays at 20 pps, 10 pps1 (primary), or 10 pps2 (secondary)
- monitor signals from the trunk interface and generate a message when required for each state change
- control disabling and enabling of unit or card
- control of A-Law and μ -Law operation modes
- control of transmission pad settings

Maintenance features

The following features are provided for maintenance of the E&M trunk:

- indication of card status from self-test
- software enable and disable capability for individual units or entire card
- loopback of PCM signals to DS-30X for diagnostic purposes
- card ID for autoconfiguration and to determine the serial number and firmware level of the card

Operation

The optional applications, features, and signaling arrangements for each unit on the E&M trunk card are assigned through the Trunk Administration (LD 14) and Trunk Route (LD 16) programs. See the *X11 input/output guide* for detailed information on assigning features and services to trunks.

Signaling and call control

The information in this section describes the signaling and call control of E&M Type I and II trunks. The call is terminated and the trunk released by a disconnect message sent to the associated unit. [Figure 45](#) shows the E&M trunk signaling orientation for a tandem connection between E&M and CO trunks.

E&M Type I signaling

[Figure 46](#) shows E&M Type I signaling patterns for incoming and outgoing calls. [Figure 47](#) shows Type I signaling patterns on a tandem connection where the originating end is senderized and the route is over a CO/FX/WATS trunk (not applicable to CCSA).

Idle state For E&M signaling, in the idle state the M lead is ground and the E lead is an open circuit.

Outgoing calls Outgoing calls are processed as follows:

- The M lead changes from ground to battery.
 - If answer supervision is provided by the far end, there is a change from open to ground on the E lead (ground detection).

Figure 45
Signaling orientation for tandem connection between E&M and CO trunks

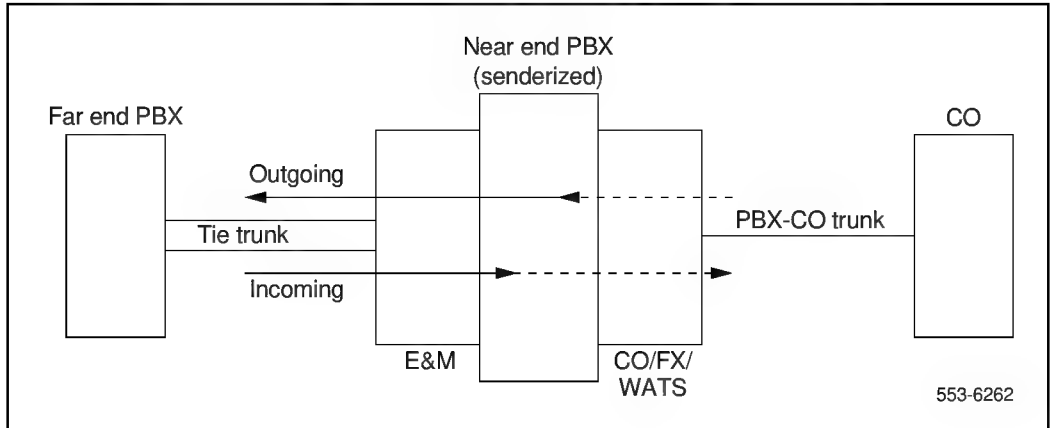
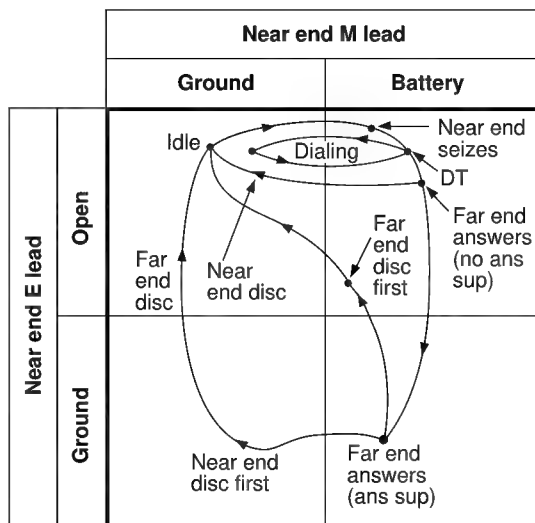
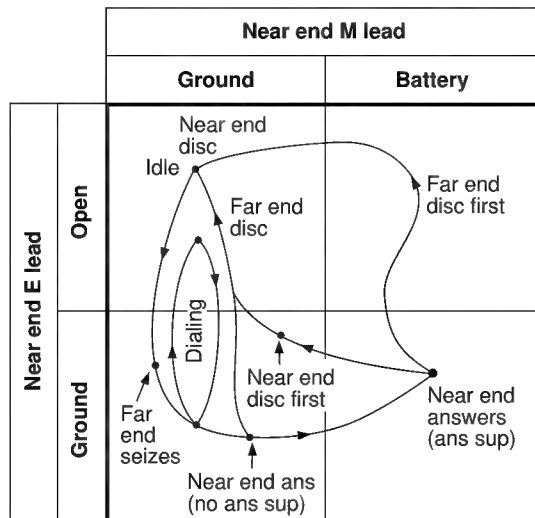


Figure 46
E&M Type I signaling patterns—originating party release



Outgoing calls from near end

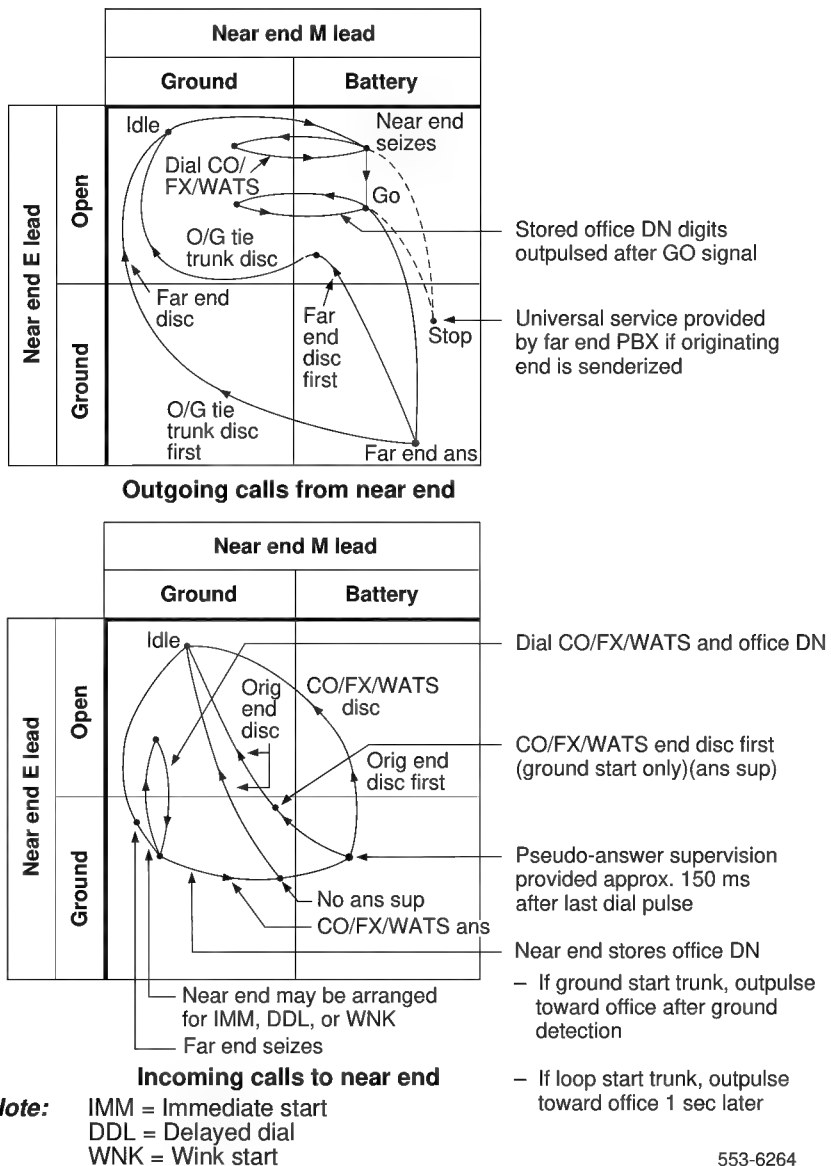


Incoming calls to near end

553-6263

Figure 47

E&M Type I signaling patterns—originating party release on a tandem connection



Incoming calls The far end initiates calls as follows:

- Ground is placed on the E lead in E&M signaling.
- Dial pulses are subsequently applied from the far end as ground open on the E lead.
- If the far end is equipped for sending, the system may be operated in any mode (immediate start, delay dial, or wink start), as assigned on a start arrangement basis (see [Table 14](#)).
 - In immediate start mode, there is no start signal from the called office. The seizure signal (off hook supervisory state) from the far end should be at least 150 ms. At the end of the seizure signal, the far end may start pulsing after the standard delay (normally 70 ms minimum).
 - In delay dial mode, a 256–384 ms off hook/on hook signal is returned to the far end immediately after receipt of the seizure signal. When the far end detects the on hook state of the signal (start signal), the far end may start pulsing after the standard delay (normally 70 ms minimum).
 - In wink start mode, within a 128–256 ms period after receipt of the seizure signal from the far end, the called office transmits a 250 ms, wink start, off hook/on hook signal to the calling office.

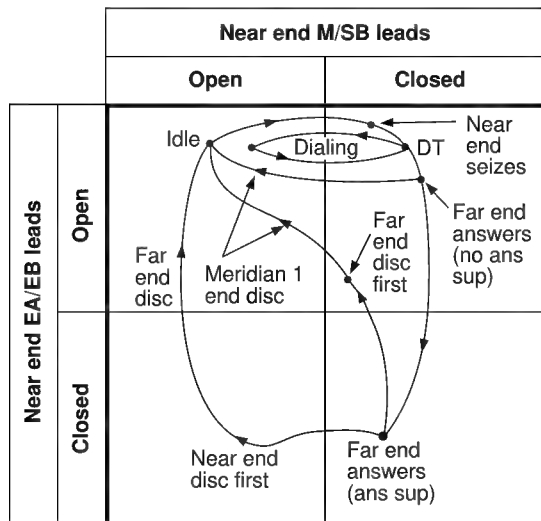
Table 14
Operation mode

Operation mode	Start arrangement
Immediate start	IMM
Delay dial	DDL
Wink start	WNK

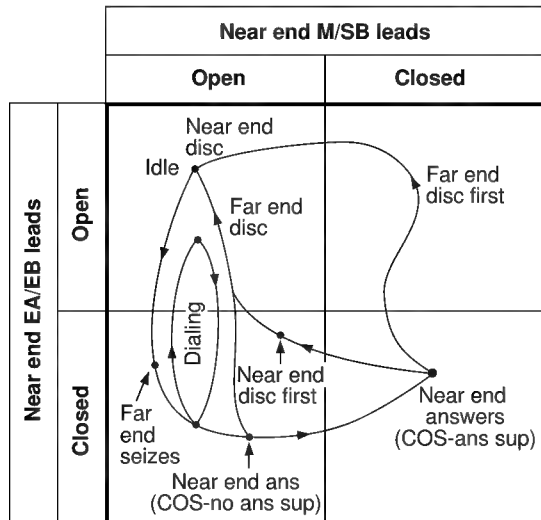
E&M Type II signaling

[Figure 48](#) shows E&M Type II signaling patterns for incoming and outgoing calls. [Figure 49](#) shows Type II signaling patterns for a tandem connection where the originating end is senderized and the route is over a CO/FX/WATS trunk (not applicable to CCSA).

Figure 48
E&M Type II signaling patterns—originating party release



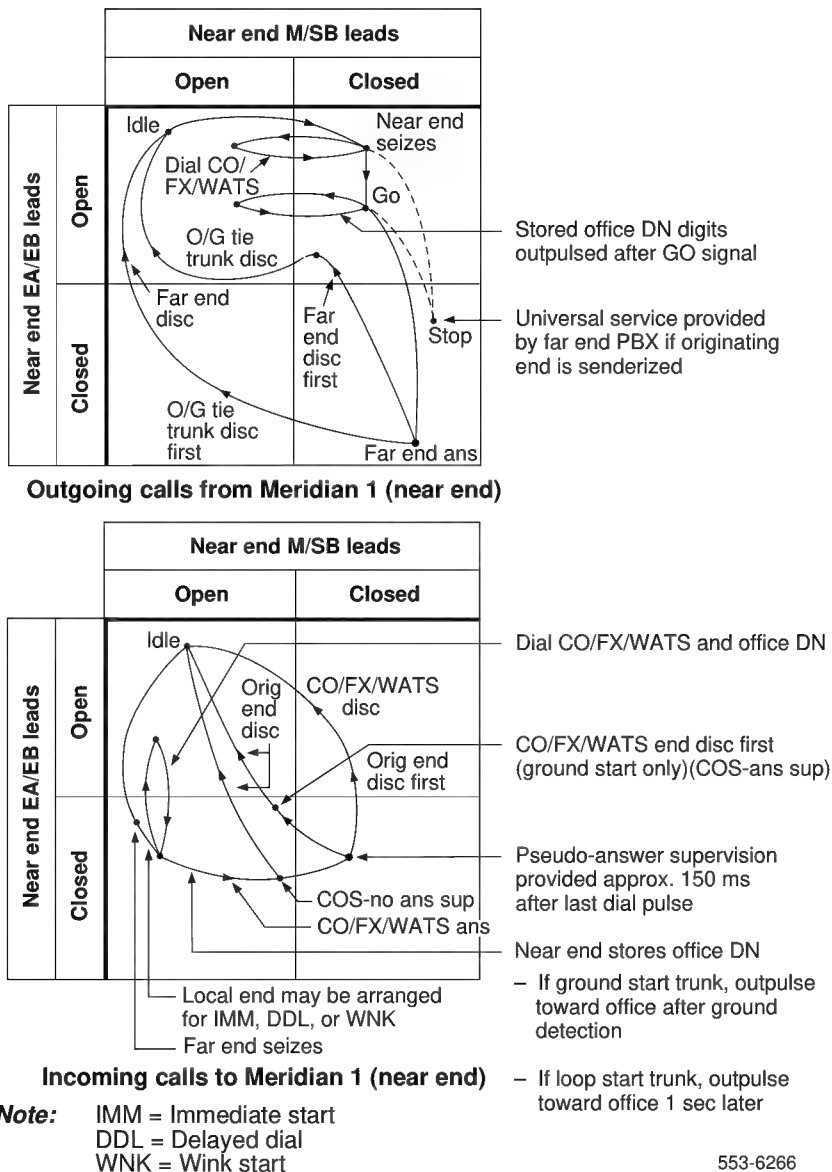
Outgoing calls from Meridian 1 (near end)



Incoming calls to Meridian 1 (near end)

553-6265

Figure 49
E&M Type II signaling patterns—originating party release on a tandem connection



Type II signaling uses four leads: M, SB, E, and SG. Instead of changes of state between battery and ground (M signals) or open and ground (E signals), the trunk signals by closing the contacts between the lead pairs M and SB. Signals are received by detecting current flow between lead pairs E and SG.

On incoming calls, the far end seizes the trunk by shorting the E and SG leads together. This transmits the ground from the SG lead to the E lead (in Type I signaling the ground to the E lead comes from the far end). Dialing is done by opening and closing the E/SG contacts. Since the SB and M leads are also used as the ESCG and ESC leads, respectively, for echo suppression, echo suppressor control cannot be used with Type II signaling.

Note: M, SB, E, and SG designations are Electronic Industries Association and Telecommunications Industries Association (EIA/TIA) conventions. These leads are also known as MB, MA, EA, and EB, respectively, in Meridian 1 conventions.

Release control

Release control of a call made over a trunk is specified in LD 16. Disconnect supervision is specified for each trunk group independently. The two options available are EITHER or ORIGINATING party control. These can be specified for the Meridian 1 end (near end), or for the CO or other PBX end (far end). Joint party control can also be specified for the far end.

Duplex (DX) signaling

DX signaling makes use of the voice transmission leads for signaling as well as for voice transmission (see Figure 6). For purposes of describing the signaling, the lead pair Tip B/Ring B is designated the signaling pair, whereas the other pair Tip A/Ring A conducts current in the opposite direction to balance the overall current flow between the near and far ends. During signaling, current flows through both Tip B and Ring B leads in the same direction.

[Tables 15](#) and [16](#) show call-connection and take-down sequencing for DX signaling. [Tables 17](#) and [18](#) show sequencing where the E&M trunk card is used in a tandem PBX.

Table 15
DX signaling—outgoing calls with originating party release

Condition	Current in signaling lead	State of trunk detector
Idle	No current flow	High
Seizure (dial tone from far end: far end ready for digits)	Current flow	High
Digits	Current flow interrupted for each pulse	High
Far end answers	No current flow	Low
Far end on hook first	Current flow	High
Network taken down and trunk idled when near end goes on hook	No current flow	High
Near end on hook first, network taken down	Current flow	Low
Far end on hook, trunk idled	No current flow	High

Table 16
DX signaling—incoming calls with originating party release

Condition	Current in signaling lead	State of trunk detector
Idle	No current flow	High
Seizure (dial tone to far end: near end ready for digits)	Current flow	Low
Digits	Current flow interrupted for each pulse	Low-high-low for each pulse
Near end answers	No current flow	Low
Far end on hook first	Current flow	High
Network taken down and trunk idled	No current flow	High
Near end on hook first, network taken down	Current flow	Low
Far end on hook, trunk idled	No current flow	High

Table 17
DX signaling—outgoing calls with originating party release on tandem connections

Condition	Current in signaling lead	State of trunk detector
Idle	No current flow	High
Seizure (far end ready for digits)	Current flow	High
Dial CO/FX/WATS	Current flow interrupted for each pulse	High
Stop sender	No current flow	Low
Go sender (universal service provided by far-end PBX if originating end is senderized)	Current flow	High
CO/FX/WATS offices ready for digits		
Stored Office DN digits	Current flow interrupted for each pulse	High
Outpulsed	No current flow	Low
Far end answers	No current flow	Low
Far end on hook first	Current flow	High
Near end on hook, network taken down, trunk idled	No current flow	High
Near end on hook first, network taken down	Current flow	Low
Far end on hook, trunk idled	No current flow	High

Table 18**DX signaling—incoming calls with originating party release on tandem connections**

Condition	Current in signaling lead	State of trunk detector
Idle	No current flow	High
Seizure (Meridian 1 may be arranged for IS, DD, or WS) (near end ready for digits)	Current flow	Low
Dial CO/FX/WATS and office DN Stored digits outpulsed on CO/FX/WATS trunk after ground detection if ground start, but after 3 s if loop start	Current flow interrupted for each pulse	Low-high-low for each pulse
If answer supervision: pseudo-answer supervision is sent approximately 13 s after last dial pulse received	No current flow	Low
If no answer supervision: CO end disconnects (CO ground start—trunk idled and network taken down, but incoming tie trunk held under control of originating end)	Current flow	Low
Originating end disconnects—network taken down and trunk idled	No current flow	High

Electrical specifications

This section lists the electrical specifications for the E&M trunk card.

Trunk interface electrical characteristics

[Table 19](#) lists the electrical characteristics of the trunk interface on the E&M trunk card.

Table 19
Electrical characteristics

Characteristic	4-wire trunk	2-wire trunk
Signaling range	Type I 150Ω Type II 300Ω loop	Type I 150Ω
Signaling type	Type I, Type II	Type I
Far-end battery	–42 to –52.5 V dc	–42 to –52.5 V dc
Near-end battery	–42.75 to –52.5 V dc	–42.75 to –52.5 V dc
Ground potential difference	±10 V dc	±10 V dc
Line leakage between E lead and ground	≥20KΩ	≥20KΩ
Effective loss	See pad table (Table 25)	See pad table (Table 25)
Terminating impedance	600Ω	600Ω
Balance impedance	N/A	600Ω

Power requirements

[Table 20](#) lists the power requirements for the E&M trunk card.

Table 20
Power requirements

Voltage	Tolerance	Max current
+15.0 V dc	±5%	200 mA
−15.0 V dc	±5%	200 mA
+8.5 V dc	±2%	200 mA
−48.0 V dc	±5 %	415 mA

Environmental specifications

[Table 21](#) provides the environmental specifications for the E&M trunk card.

Table 21
Environmental specifications

Parameter	Specifications
Operating temperature	0 to +60 degrees C (32 to +140 degrees F), ambient
Operating humidity	5 to 95% RH (noncondensing)
Storage temperature	−40 to +70 degrees C (−40 to +158 degrees F)

Foreign and surge voltage protection

The E&M trunk card meets CS03 over-voltage (power cross) specifications and FCC Part 68 requirements.

Connector pin assignments

The E&M trunk card brings the four analog trunks to the IPE backplane through a 160-pin connector shroud. The backplane is cabled to the input/output (I/O) panel on the rear of the module, which is then connected to the main distribution frame (MDF) by 25-pair cables.

Telephone trunks connect to the E&M trunk card at the MDF using a wiring plan similar to that used for line cards. A typical connection example is shown in [Figure 50](#), a list of the connections to the E&M trunk card in the various 2-wire modes is shown in [Table 22](#), and a list of the connections to the E&M trunk card in the various 4-wire modes is shown in [Table 23](#). See *Meridian 1 system installation procedures* (553-3001-210) for complete I/O panel connector information and wire assignments for each tip/ring pair.

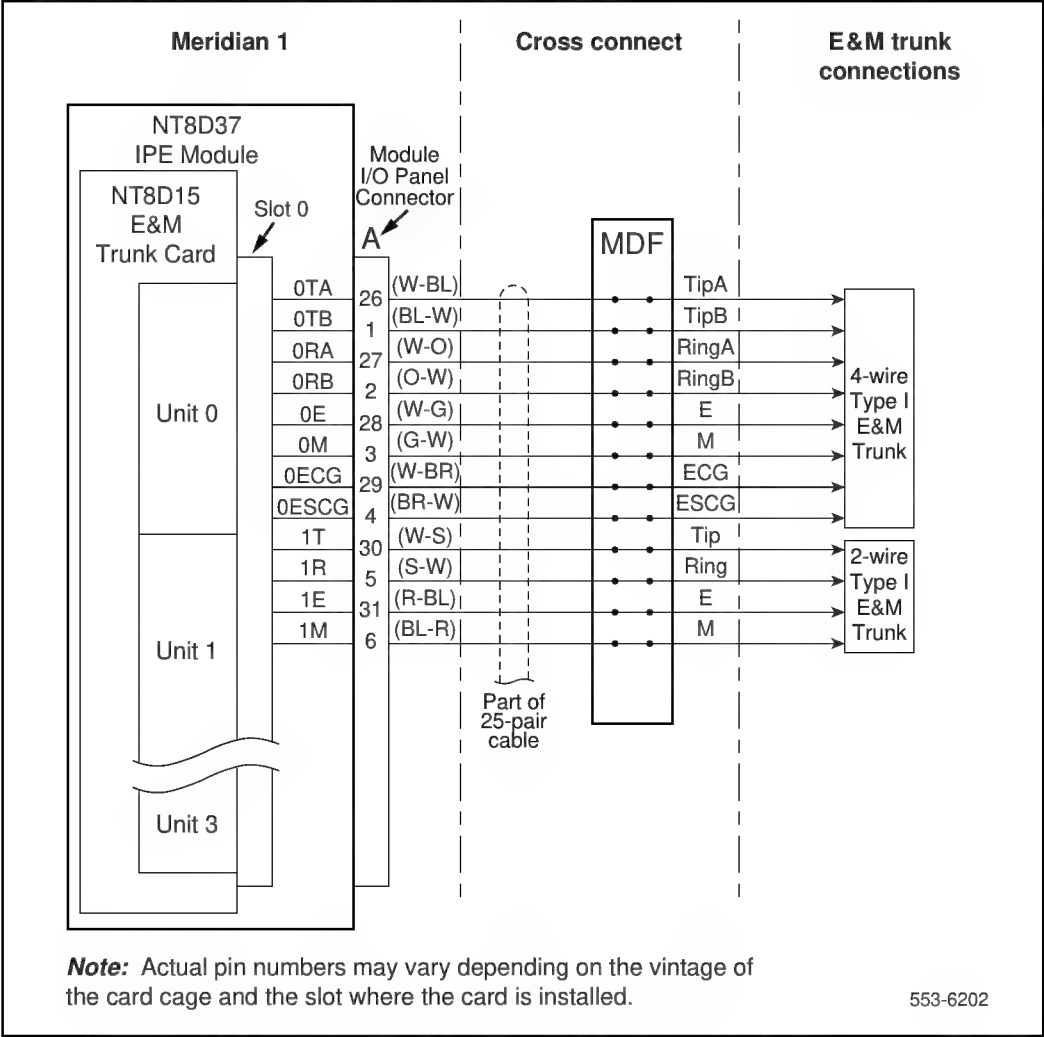
Table 22
E&M trunk card—backplane pinouts for 2-wire modes

Trunk Number	2-wire Paging Mode				2-wire Type I Mode			
	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
0	12B	Tip	12A	Ring	12B	Tip	12A	Ring
	15B	A	15A	PG	14B	E	14A	M
1	16B	Tip	16A	Ring	16B	Tip	16A	Ring
	19B	A	19A	PG	18B	E	18A	M
2	62B	Tip	62A	Ring	62B	Tip	62A	Ring
	65B	A	65A	PG	64B	E	64A	M
3	66B	Tip	66A	Ring	66B	Tip	66A	Ring
	69B	A	69A	PG	48B	E	68A	M

Table 23
E&M trunk card—backplane pinouts for 4-wire modes

Trunk Number	4-wire Type I Mode				4-wire Type II Mode			
	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
0	12B	TA	12A	TB	12B	TA	12A	TB
	13B	RA	13A	RB	13B	RA	13A	RB
	14B	E	14A	M	14B	EA	14A	EB
	15B	ECG	15A	ESCG	15B	MA	15A	MB
1	16B	TA	16A	TB	16B	TA	16A	TB
	17B	RA	17A	RB	17B	RA	17A	RB
	18B	E	18A	M	18B	EA	18A	EB
	19B	ECG	19A	ESCG	19B	MA	19A	MB
2	62B	TA	62A	TB	62B	TA	62A	TB
	63B	RA	63A	RB	63B	RA	63A	RB
	64B	E	64A	M	64B	EA	64A	EB
	65B	ECG	65A	ESCG	65B	MA	65A	MB
3	66B	TA	66A	TB	66B	TA	66A	TB
	67B	RA	67A	RB	67B	RA	67A	RB
	68B	E	68A	M	68B	EA	68A	EB
	69B	ECG	69A	ESCG	69B	MA	69A	MB

Figure 50
E&M trunk card—typical cross connection example



Configuration

Each of the four trunk circuits on the E&M trunk card can be individually configured for trunk type, companding mode, and port-to-port loss compensation. Configuring the card requires both jumper changes and configuration software service entries. The locations of the jumpers are shown in [Figure 51](#).

Jumper settings

The NT8D15 E&M Trunk Card serves various transmission requirements. The four units on the card can operate in A-Law or μ -Law companding modes, which are selected by service change entries. Each unit can be independently configured for 2-wire E&M, 4-wire E&M, and paging trunk types. The trunk type is selected by service change entries and jumper strap settings (see [Table 24](#) and [Figure 51](#)).

Software service entries

The trunk type is selected by making service change entries in the Trunk Route Administration Program (LD 16). The companding mode is selected by making service change entries in the Trunk Administration Program (LD 14). Refer to [Table 24](#) to select the proper values for the trunk type being employed. Refer to the *Meridian 1 X11 input/output guide* for LD 14 and LD 16 service change instructions.

Figure 51
E&M trunk card—jumper locations

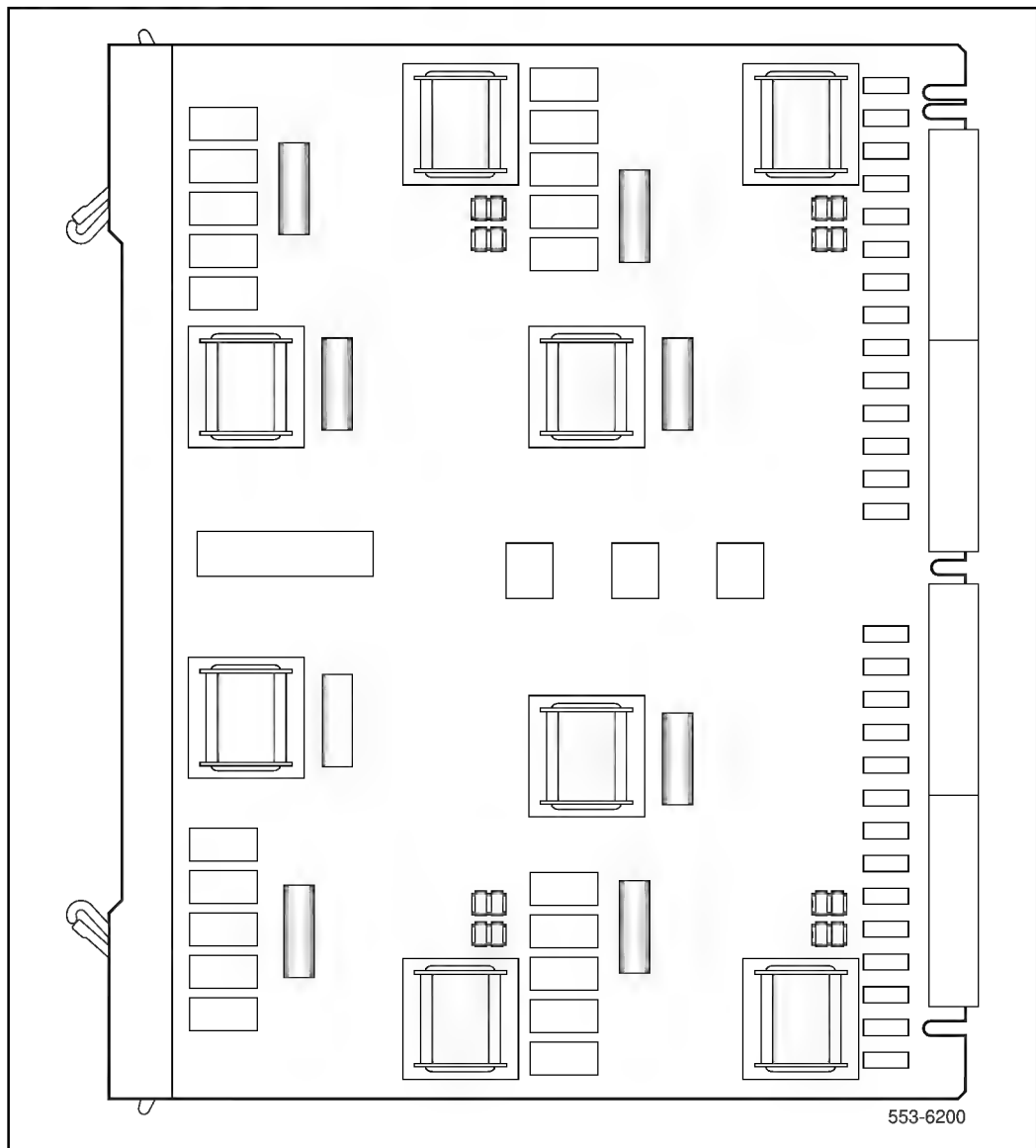


Table 24
E&M trunk card—jumper strap settings

Jumper (Note 1)	Mode of operation (Note 2)					
	2-wire trunk		4-wire trunk			
	Type I	Paging	Type I	Type II	DX tip & ring pair	
					M—rcv E—xmt	E—rcv M—xmt
J1.X	Off	Off	Off	Off	Pins 1–2	Pins 2–3
J2.X	On	On (Note 3)	On	On	Off	Off
J3.X	Off	Off	Off	Off	(Note 4)	(Note 4)
J4.X	Off	Off	Off	Off	Pins 2–3	Pins 1–2
J5.X	Off	Off	Off	Off	(Note 4)	(Note 4)
J6.X	Off	Off	Off	Off	On	On
J7.X	Off	Off	Off	Off	On	On
J8.X	Off	Off	Off	Off	On	On
J9.X	Pins 2–3	Pins 2–3	Pins 2–3	Pins 2–3	Pins 1–2	Pins 1–2
Note 1: Jumper strap settings J1.X through J9.X apply to all four units; “X” indicates the unit number, 0–3. Note 2: “Off” indicates that no jumper strap is installed on a jumper block. Note 3: Paging trunk mode is not zone selectable. Note 4: Jumper strap installed in this location only if external loop resistance is greater than 2500 ohms.						

Port-to-port loss configuration

Loss parameters are selected on the E&M trunk card by a switchable pad controlled by codec emulation software. For convenience in this discussion, the pads settings are called “in” and “out.” Pad settings are determined by the three factors listed below: the first two are under direct user control; the third is controlled indirectly.

- Class of service is assigned in LD 14.
- Facility termination is selected (2-wire or 4-wire) in LD 14 (the 2-wire setting provides 0.5 dB more loss in each direction of transmission for echo control).

Note: Facilities associated with the Northern Telecom Electronic Switched Network (ESN) are recommended to be 4-wire for optimum transmission; thus, the 4-wire setting is generally referred to as the ESN setting. However, the 4-wire setting is not restricted to networks using the ESN feature. Conversely, the 2-wire setting, often called non-ESN, can be used on certain trunks in an ESN environment.

- Port-to-port connection loss is automatically set by software on the basis of the port type selected in LD 16; only the port type is set by the user.

The transmission properties of each trunk are characterized by the class of service assigned in LD 14. Transmission properties can be via net loss (VNL) or not via net loss (non-VNL).

The VNL class of service is assigned at the prompt CLS with the response VNL. The non-VNL class of service is assigned at prompt CLS by selecting either the TRC (transmission compensated) or NTC (non-transmission compensated) response.

Non-VNL trunks are assigned a TRC or NTC class of service to ensure stability and minimize echo when connecting to long-haul trunks, such as tie trunks. The class of service determines the operation of the switchable pads contained in each unit. They are assigned as follows:

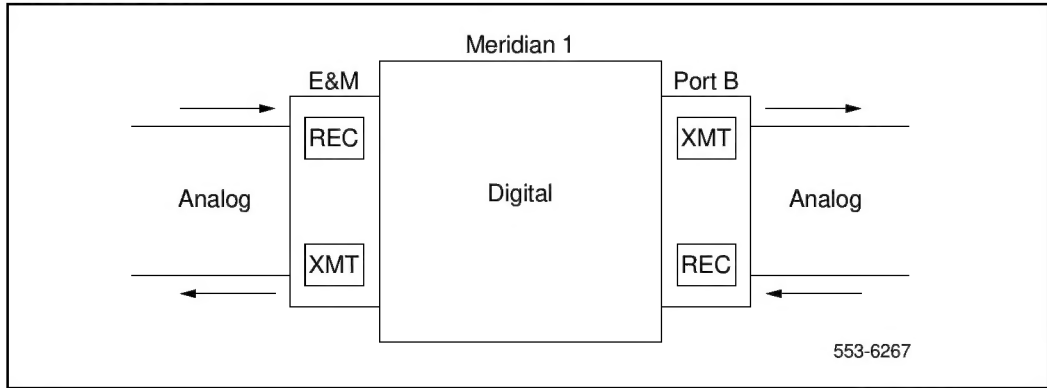
- TRC for a 2-wire non-VNL trunk facility with a loss of greater than 2 dB, or for which impedance compensation is provided, or for a 4-wire non-VNL facility
- NTC for a 2-wire, non-VNL trunk facility with a loss of less than 2 dB, or when impedance compensation is not provided

See [Table 25](#) for the pad switching control for the various through connections and the actual port-to-port loss introduced for connections between the E&M trunk card and any other IPE or PE port designated as Port B. [Figure 52](#) shows the pad switching orientation.

Table 25
Pad switching algorithm

Port B	Port B pads		E&M Trunk Pads		Port-to-port loss (dB)	
	Transmit D to A	Receive A to D	Transmit D to A	Receive A to D	Port B to E&M	E&M to Port B
IPE line	N/A	N/A	Out	In	2.5	3.5
Universal trunk (TRC)	Out	Out	In	In	0	0
IPE tie (VNL)	In	Out	In	Out	0	0
PE line	N/A	N/A	Out	In	3.0	4.0
PE CO/FX/WATS (TRC)	Out	Out	In	In	0	0
PE tie	Out	Out	In	In	0	0
Note: Transmit and receive designations are from and to the Meridian 1. Transmit is from the Meridian 1 to the external facility (digital-to-analog direction in the E&M trunk card). Receive is to the Meridian 1 from the external facility (analog-to-digital direction in the E&M trunk card).						

Figure 52
Pad orientation



Applications

Paging trunk operation

When used in the paging mode, a trunk is connected to a customer-provided paging amplifier system (not zone selectable). When the trunk is accessed by dial-up or attendant-key operation, it provides a loop closure across control leads PG and A1 (see [Figure 53](#)). In a typical application, this transfers the input of the paging amplifier system to the transmission path of the trunk.

Figure 53
Paging trunk operation

